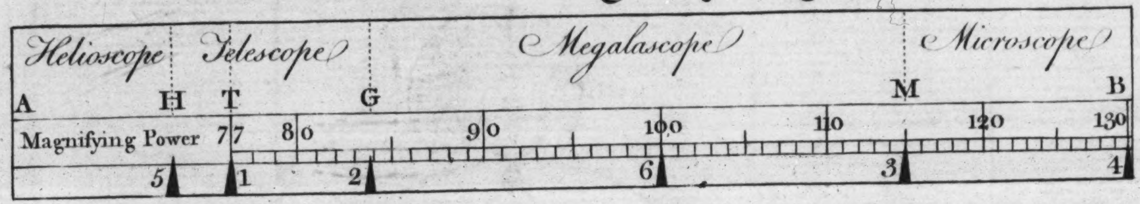
A SCALE of Magnifying POWERS,



For the UNIVERSAL PERSPECTIVE.

Whitchurch sculpsit. Islington.

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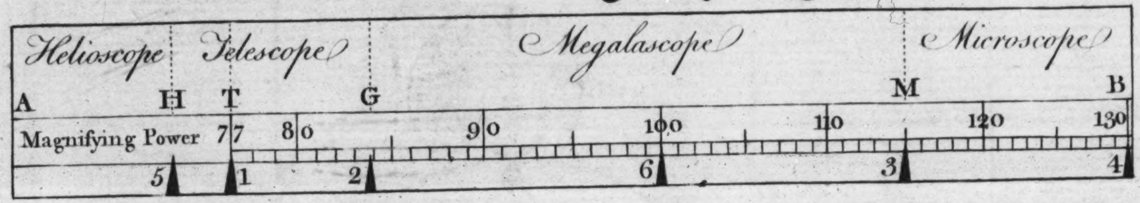

For the UNIVERSAL PERSPECTIVE.

Whitchurch ſculpſit. Iſlington.

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AN

ESSAY

ON A

NEW CONSTRUCTION, OF THE REFLECTING TELESCOPE,

WHICH BY MEANS OF A
SCALE OF MAGNIFYING POWERS,
IS MADE AN
Univerſal PERSPECTIVE.

PERFORMING THE OFFICE OF

I. Of a common Reflecting TELESCOPE.
II. ENGYSCOPE, for ſhewing all near Objects.
III. A MEGALASCOPE, for all the larger Sort of ſmall Objects.
IV. A MICROSCOPE, for ſmall Objects.
V. A HELIOSCOPE for making the Sun's Image by Reflection only.
VI. A HELIOSCOPE by Reflection and Refraction.
VII. A *Solar-Diſk* MICROSCOPE.
VIII. A *Catadioptric* MICROSCOPE.

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collated

ADVERTISEMENT.

Juſt Publiſhed

Uraniſcopium Magnum;

OR THE

DESCRIPTION of a new CONSTRUCTION of an *Equatorial* TELESCOPE, by CLOCK-WORK, regulated by a *Planetary* PENDULUM, by which means the Teleſcope is conſtantly directed to the celeſtial Object, during the Time of obſervation.

Likewiſe juſt Publiſhed,

Microſcopium Pantometricum,

OR A

NEW CONSTRUCTION of a MICROMETER adapted to the *Compound* and *Solar* MICROSCOPE, by which ſmall Objects are meaſured (in all their DIMENSIONS,) with the utmoſt Eaſe and Readineſs.

BRITISH MUSEUM 14 NOV 63

DIRECTIONS
FOR THE
USE of the *Univerſal Reflecting*
PERSPECTIVE.

NO optical Invention extends the Pleaſure of *diſtant* VIEWS and PROSPECTS, like that of the TELESCOPE; but tho' this be the Principal, it is not the only Uſe to which this noble Inſtrument may be applied; for by the THEORY it appears, that the Teleſcope is capable of ſhewing near Objects as well as remote ones, and magnifying them much more; even ſo far, as, in a great Meaſure, to ſupply the Place of the MICROSCOPE, as it does that of a MEGALASCOPE, in the utmoſt Perfection.

Nothing more is neceſſary for this purpoſe than only *increaſing the Length of the Reflector* a few Inches, viz. 3 Inches in the foot Reflector; 4 Inches in that of 18 Inches; and 6 Inches in the 2 Foot Teleſcope.

Then an *Index* being fixed to the Slider which carries the ſmall *Speculum*, will point to the ſeveral magnifying Powers contained in a Scale A B adapted to the Teleſcope, as is repreſented in the Print of the FRONTISPIECE, which contains the magnifying Powers from 77 to 130, in a Reflector of an 18 inch Metal.

By a Piece of Rack-work on the Side of the Teleſcope, the Mirror and Index are adjuſted, for the View of any Object not nearer than 4 *times the focal Diſtance* of the large Speculum, which, in this Example of an 18 Inch Reflector, is 6 Feet. So that this Inſtrument ſhews all Objects from 6 Feet to an infinite Diſtance.

To be particular in the Uſe of this *univerſal Teleſcope*, you will obſerve the Index is ſhewn in *Six different Poſitions*, as denoted at the Figures 1, 2, 3, 4, 5, 6, under the Scale A B. In each of theſe Poſitions the different magnifying Powers give a different Denomination to the Inſtrument. Thus;

In the *firſt* POSITION at No. 1, the Index points to 77 in the Scale, and ſhews this to be the *leaſt magnifying Power*; that in this Poſition, the Inſtrument is properly a TELESCOPE adapted to ſhew very diſtant Objects, and magnifies them 77 Times, in Length and Breadth. Whilſt the Index ſtands preciſely under the Letter T it ſhews the SUN, MOON, PLANET, and all *celeſtial Objects*; as alſo all Land Objects till they come to be within about half a Mile's Diſtance.

But by turning the Pinion in the Rack-work, the Index advances towards G, and all the Time it is paſſing from T to this ſecond Poſition at G No. 2, it is fitted to ſhew diſtinctly all Objects not leſs than 15 Feet diſtant, and magnifies them from 77 to $83\frac{1}{2}$ Times. Hence ſince all Objects from 15 to 100 Feet Diſtance, may be conſidered as *near Objects*; the Inſtrument during

BRITISH MUSEUM 4 NOV 53

the Paſſage of the Index from T to G, may be properly called an ENCYSCOPE.

From the *ſecond Poſition* at No. 2, the Index (*by turning the Pinion*) will advance to the *third Poſition* at No. 3, exactly under M, and during its Paſſage from G to M, it ſhews very diſtinctly all Objects in the Diſtances between 15 and 5 Feet, and magnifies from 83½ to 115 Times. Conſequently in this Interval it magnifies greatly all the *larger Sort of ſmall Objects*, viz. thoſe about *One Inch diameter*, more or leſs; and therefore merits the Title of a MEGALASCOPE.

From the third Poſition of the Index at No. 3, under M, it is carried by the Screw to No. 4, at the End of the Scale under B; and during this Motion from M to B, it magnifies from 115 to 130 Times. This Interval takes in all Objects between 5 and 4 Feet from the Surface of the *large Speculum*. And as it magnifies them 130 Times at the Diſtance of 4 Feet, it is at the Rate of 20½ for 8 Inches; that is, every Object ſeen when the Index points to 130 at B, ſubtends an Angle 20½ Times greater than it would do to the naked Eye, at the Diſtance of 8 Inches; and conſequently the Inſtrument now becomes a MICROSCOPE with different magnifying Powers.

By ſcrewing off the Eye-piece, and letting a Beam of the Sun's Light come thro' a Hole in the Window-Shutter, and paſſing directly thro' the Tube to the great Mirror, it will from thence be reflected to its Focus, where the Image of the Sun will be formed; before this Image the ſmall Mirror may be ſo placed, (by turning the Pinion) that another Image ſhall be formed by it at what Diſtance you pleaſe, and ſo large that you may ſee the Spots without hurting the Eye, and view *ſolar Eclipſes* this way in the beſt Manner. The Index pointing at No.

No. 5 under H, will give the Sun's Image between 4 and 5 Inches Diameter; and from this Operation of the Inſtrument it is juſtly denominated a HELIOSCOPE, and that by Reflection only.

But the Image of the Sun is made much larger with the Eye-piece in its Place, by ſcrewing the Index a little towards the left hand of the Letter T; for then upon a large Sheet of white Paſteboard, or Paper Screen, held behind the Teleſcope, the Image of the Sun will be formed from 12 to 18 Inches, or 2 Feet Diameter, according to the Diſtance of the Screen, and ſo very diſtinct, that its Spots may be moſt eaſily and accurately obſerved with all their Changes and Variations which they undergo from Day to Day, or in any given Time.

In this Way of making a HELIOSCOPE. You may at the ſame Time make an excellent SOLAR-DISK MICROSCOPE, which is an entire new Inſtrument in Optics, as it differs eſſentially from a common *ſolar-Microſcope*, in which no Image or Diſk of the Sun is formed at all, the Objects being only ſtrongly illumined by his Rays; whereas in this, the whole DISK of the SUN is accurately formed; on which, as a *luminous Ground*, all Objects are largely depicted and portrayed, and make as it were a warm and a *glowing* PICTURE on the Screen, amids the *Maculæ*, equally viſible and diſtinct at the ſame Time. But for this fine Purpoſe, a different Eye-piece is required, but which at the ſame, Time ſerves for a SINGLE MICROSCOPE of the moſt perfect Sort.

For ſuch as are curious, a Door is made in the ſide of the Tube near the farther End, and a proper *Apparatus* for holding Objects, and adjuſting them to the ſmall Speculum in ſuch Manner as to exhibit a moſt curious magniſied Appearance of them; and conſequently to conſtitute one of the moſt noble and perfect Sort of *Catadioptric* MICROSCOPES, ſo much recommended by Sir Iſaac NEWTON.

One Uſe more is to be made of this *univerſal* PERSPECTIVE, viz. *To magnify any Object in any given Degree within the Scale* A B.

For Inſtance, ſuppoſe it were required *to magnify an Object juſt* 100 *Times*. This you do, by turning the Screw till the Index points to 100 on the Scale, (as at No. 6,) and then moving the Inſtrument forwards or backwards in a right Line, you will ſoon find the Place where it appears very diſtinct; and it is then *magnified* 100 *Times in Length and Breadth, as deſired.*

N. B. Theſe reflecting Perſpectives are made of *Three* different Sizes, viz. (1.) The *Firſt* or ſhorteſt, has the large Speculum of 9 Inches focal Diſtance; and magnifies from 44½ to 75½ Times. (2.) The *Second* Size has the large Speculum of 12 Inches focal Diſtance; and magnifies from 77 to 130 Times. (3.) The *Third* has the large Speculum of 18 Inches focal Diſtance; and magnifies from 163 to 280 Times.

A Power of magnifying 90 Times will take in an Object of ½ an Inch width, and therefore the whole of a *Fleſh-fly*, a *Bee*, *Gnats*, and other curious *Inſects*, *Animals*, *Flowers*, *Foſſils*, &c. whoſe *apparent Magnitude* will, in this Caſe, be nearly 4 Feet; that is, the *Fly*, &c. will appear 4 Feet long, and all its Parts in proportion large.

I know when Perſons (not uſed to optical Experiments) are told the Object they are viewing is magnified ſo great a Number of Times, they do not think it appears to be ſo much magnified, and can ſcarcely believe it; but the Reaſon is becauſe they have no Rule to judge, or prove it by. Therefore to be convinced of the true magnified Appearance, proceed thus; take a long ſtrait ſlip of Paper, white Deal, &c. and divide it into 40, 50, or 60 Inches by black Lines, then lay the *Fleſh-fly*, &c. at the End of the Paper, and approach with the Perſpective till you ſee it very plain; then open the other Eye, the Paper will be ſeen by it; and moving the Inſtrument properly, you will with one Eye ſee the Object, and with the other, the Paper under it; and conſequently you will ſee how many Inches it equals on the Paper; and ſo be convinced of its apparent Magnitude. For Example, ſuppoſe the Fly to be ½ an Inch long, and that its Image equals 45 Inches on the Slip, then it is evidently magnified 90 Times in *Length*, 8100 Times in *Surface*; and 729000 Times *in Bulk*, or *ſoild Content.*

After this Detail of ſo rich a Variety of Uſes to which the *Reflecting* TELESCOPE may be applied, it is juſtly a Matter of aſtoniſhment to obſerve how ſupinely contented the Generality of People are with *one ſingle Uſe of it only*; even the Poverty of the common Conſtruction will afford, at leaſt, *two or three* more. But what avails the Profuſion and Exuberance of Nature, or the utmoſt Efforts of Art, while Mankind appear ſo little ſolicitous about either? However, there will always be found a few who do Honour to their Species by rational *Purſuits*; who are always delighted, with the truely charming Scenes of Nature's glorious *Pantheon*; and it is in regard to them that all my leiſure Hours are are employed in this Way.

FINIS.

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